Year 9 Graphic Products—Specialist Materials and Processes

Properties and Definitions of Paper and Boards

Property	Definition	Found in
resistant	Does not deform easily without tools or force.	thicker/laminated paper, board products
stiffness	A material that resists bending, remains rigid.	foam board, corrugated card
tension	A pulling force. Paper and board products when assembled often are glued in tension.	glued together packages

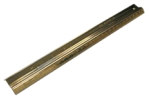
Virgin Products

Foam Board: Thick, lightweight and stiff. A layer of foam is laminated between bleached card. Can be slotted and jointed to give strength to larger constrictions.

Used in model-making, architectural prototypes.

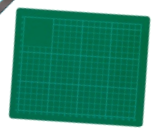
Mount Board: A thick, flexible board, available usually in black or white.

Safety Ruler



Craft Knife

Cutting Matt



Glue Gun

Addition

White Glue (such as PVA)

Advantages:

Permanent, strong bond, even on small tabs. Invisible.

Disadvantages:

Cannot be undone, takes a long time to set.

Spray Mount Glue

Advantages: Easy to apply, Sets quickly

Disadvantages: Can show through paper

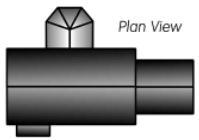
Laser Printing

Laser printing is an electrostatic digital printing process. It produces high-quality text and graphics (and moderate-quality photographs) by repeatedly passing a laser beam back and forth over a negatively charged cylinder called a "drum" to define a differentially charged image. Laser printers are used in our school for all printing!

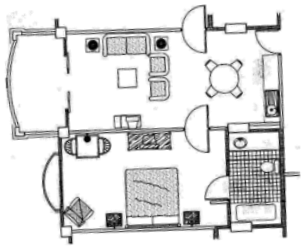
Scale modeling

Designers can often make use of scaled models to represent a design. This can be for anything from a building, hand-held product or a piece of packaging. Scale models can give the designer or customer a much clearer idea of the design intentions and can be produced to a smaller or larger scale, viewed from any angle and quite quickly produced where necessary. Materials such as Foam Board or Mount Board serve as perfect modelling materials that can easy be covered in a digitally printed surface. Block Foam modelling is another technique that can be used to create more unusual and creative shapes by shaping a block of foam using a range of saws, files and glass paper.

Drawing Techniques

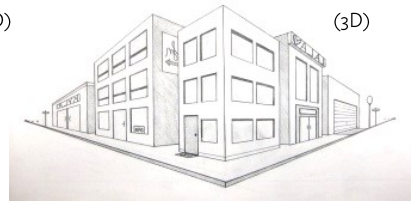


Orthographic Projection (2D)



Plan Views (2D)

Perspective (3D)



Wasting

Most paper and board can be cut and shaped easily with basic equipment.

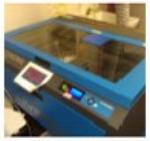
Wasting Paper and Board Using CAD/CAM

Thin card can be wasted effectively using CAM such as laser cutters and cutter/plotters. Nets are developed on CAD software such as 2D Design and CorelDRAW. These files are sent to the CAM machine for accurate cutting and scoring.

Laser Cutter

Advantages:

Allows for repetitive flow production, with reliable, identical results.



Disadvantages:

Not suitable for foam-board due to the fumes released.

Temporary Addition Methods:

Adhesive Velcro

Advantages:

Allows for adjustment.

Disadvantages:

Expensive, not suitable for thinner, less stiff materials.

Paper Fasteners

Advantages:

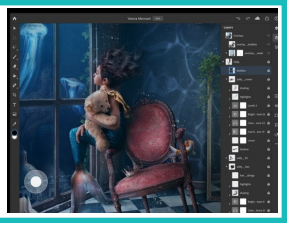
Easily undone. Quick.

Disadvantages:

Hard to disguise, Sharp edges make it unsuitable for many applications.

Photoshop (Computer Aided Design)

Photoshop is a great example of Computer Aided Design that is often used in the creation of Graphic Products and digital art. This program uses pixel based images that can be layered up, enhanced and effects applied. Text can also be added to create a final design. Completed designs can then be printed using laser or commercial printers for magazines, cards or packaging.



Year 9 D&T Core Knowledge Organiser

Design Influences

The Impact on the Environment: Life Cycle Assessment

Designers must be aware of the impact that the manufacturing, use and disposal of their products may have. Understanding the materials used, components and energy sources involved help to build a picture of how environmentally friendly a product's production and use could be.

The main stages of Life Cycle Assessment are:

Raw Materials

- product requires reduced amount of raw materials;
- product uses recycled materials extensively.

Manufacturing

- production conserves energy;
- production conserves materials/allows recycling of raw materials
- prevention of pollution to air, water and underground water.

Distribution

- product uses simplified packaging;
- product is distributed more efficiently;
- product is delivered by low-emissions vehicle.

Consumer Use

- product consumes less power;
- reduced use of additional materials (for instance water, oils,

Post-Consumer Use

- product is designed for disassembly/easier recycling;
- product uses lower amounts of harmful substances.

6R's of Sustainability

REDUCE What parts can you reduce in size to save material? Are all the parts needed to make the product function the way you designed it?	**REFUSE** What materials could you refuse to use? Could you refuse to use materials that have not been responsibly sourced?
RETHINK How could you rethink the design to use less material? Could you choose more environmentally friendly materials?	**RECYCLE** Could parts be made from recycled material? Could you use materials that can be recycled?
REUSE Could the product have another use? Could its parts be used in other products to extend the products life?	**REPAIR** Is the product easy to repair when its broken? Can fixings be easily accessed?

Manufacturing Techniques

Bought-In Parts

Many products and manufacturers make use of 'Bough-In' parts and standard components. These may include zips, buttons, nuts and bolts, wood dowels or hinges for example. This is often to reduce costs, use less specialist machines and make manufacturing simpler.

Computer Aided Manufacturing (CAM)

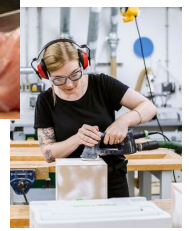
A range of computer guided machines can be used by manufacturers to complete highly accurate products or components at speed. Due to the machines following step-by-step code (generated by a computer), it is possible for parts to be replicated over and over. Examples of CAM include computer guided laser cutters, embroidery machines, Routers and Vinyl cutters. Robotic Arms also allow flexibility in manufacturing and the ability for products or parts to be moved between machines automatically.

Computer Controlled Laser Cutter

Robotic Arm

Health and Safety

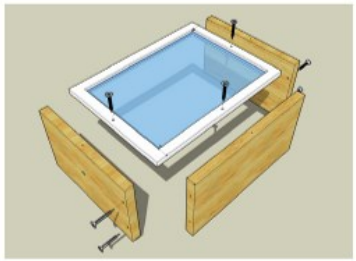
When moving on to practical work for your projects, the rules associated with a classroom in D&T are vital to keep you and others safe. You need to be able to recall these rules and understand their importance. Based on different locations or activities, you should be able to identify associated risks and state at least two separate control measure that can be put in place to help reduce potential risks to those undertaking the activity and others around them. The use of PPE (Personal Protective Equipment) is one important way of staying safe in any practical room. This may include the use of aprons, goggles, ear defenders or gloves for example. Health and hygiene is also vital in areas such as kitchens.



Design Communication and Manufacture

Exploded Drawings

These technical drawings can be useful in helping to explore how components and parts fit together. They can be drawn up more accurately and form a plan for the assembly of parts when producing a final prototype.



Mathematical Modelling

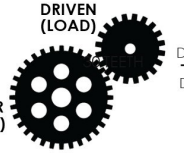
All models can contain some mathematical information to help a designer, but sometimes it is necessary to create a special model, for the purpose of gaining mathematical information about the intended product. This might include:

- calculating the amount of material required;
- researching joining solutions;
- using structural strength data;
- making calculations to do with the overall size and weight of the product.

Maths in D&T

Working out gears ratio (velocity).

In your GCSE exam there could possibly be questions referring gears and mechanisms. You will need to work out the gear ratio, often referred to as velocity.



$$\frac{\text{Distance moved by Effort}}{\text{Distance moved by Load}} = \frac{60}{30} = \frac{1}{2}$$

$$= 1:2$$

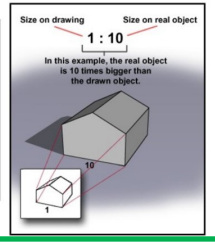
Working out scale in technical drawings: Ratio & Proportion.

Ratios are used in everyday life and can help you work out problems including scale drawings and reading maps. In a scale drawing, all dimensions have been reduced by the same proportion.

When producing orthographic drawings such as product plans it is not almost possible to draw them on a single piece of paper.

Instead they are drawn to a smaller, reduced size. The size reduced becomes its ratio.

Twice as small = 2:1
Ten times smaller = 10:1



Ratios are usually written in the form A:B.

After all an Architect couldn't draw a full size house on a single piece of paper.